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ABSTRACT

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EFFECTIVE SCHOOLS: CHARACTERISTICS OF SCHOOLS WHICH PREDICT MATHEMATICS AND SCIENCE PERFORMANCE*

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ABSTRACT

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Literature on school effects is inconclusive regarding which characteristics of schools are important to study. The research reported in this paper, which explores the effects of schools on mathematics and science performance, alters prior models in two ways. First, the schools are examined in terms of the school context, that is whether the student body is predominantly of high-ability or low-ability. Second, differential effects upon individual students of different ability levels is also considered. Empirical analyses using the High School and Beyond data find that schools do influence mathematics and science performance, primarily through their influence upon the taking of mathematics and science courses. Of particular importance are the curricular organization created by the school and the academic encouragement given to the student. Furthermore, these effects of schools are clearer when the context of the school and the relationship of the student to the school environment are considered.

"Effective Schools: Characteristics of Schools which Predict Mathematics and Science Performance"

Our purpose in this paper is to present the results of research designed to investigate various conceptual and empirical models of effective schools. Of particular interest are those characteristics of schools which enhance or detract from student performance in two curricular areas -- mathematics and science. In addition, the research examines the effects of schools while considering the context of the school, that is the average ability level of students attending the school, as well as the ability levels of the students themselves.

Prior studies are inconclusive with regard to whether schools have an effect on student performance, and if so, which characteristics of schools are important to study. Some have suggested that schools have little influence on student performance once social origin and ability are taken into account (Coleman et al., 1966; Jencks et al., 1972; Husen, 1972; Wiley and Harnischfeger, 1974; Averch et al., 1972; Walberg and Rasher, 1979). These conclusions have been challenged. It has been pointed out that some of the early research on which the conclusions were based employed a cross-sectional design from which changes over time must be inferred, that the unit of analysis was individuals rather than schools, and that the measures of school characteristics have been measures of resources such as library holdings and teachers' salaries, and not treatments of students such as classroom management or curriculum grouping. Critics of the methodologies and data employed in the early studies reanalyzed original data banks and presented new evidence indicating that certain characteristics of schools are indeed related to educational achievement (Guthrie et al., 1971; Bowles and Levin, 1968; Hanushek and Kain, 1972; Bowles, 1970; Smith, 1972; Wiley, 1976). Nevertheless, the confusion was not entirely alleviated by such efforts (Welch et al., 1982).

Within the last five years, a number of studies of school effects have begun to identify certain characteristics which may indeed influence student learning. Some of these studies have employed longitudinal designs, used schools as well as individuals as the unit of analysis, and have refined the school variables being examined. Three major research efforts of this type were conducted by Rutter et al. (1979), Brookover et al. (1979) and Coleman et al. (1982). The Rutter et al. (1979) study discovered dramatic variations in the performance of students in different schools, even when their social backgrounds were held constant. In particular, between-school variations were related to the level of student ability at intake, the degree of academic emphasis, teaching patterns, types of incentives and rewards, school values, and pupil responsibilities. Using data on students in 68 elementary schools, Brookover and colleagues (1979) reported another school effect, that the expectations of principals and teachers explained as much of the variance in outcomes as did the student body composition.

In a cross-sectional analysis of data from the High School and Beyond study, Coleman et al. (1982) reported that students in Catholic and other

private high schools perform better on academic achievement tests than students in public schools, other things being equal. The superiority of the private schools, according to the researchers, owes much to the fact that the Catholic-school students take more academic course work, do more homework, and are more strictly disciplined. However, like the first study by Coleman and his colleagues, this one has also been met with a volley of criticism (Crain and Hawley, 1982; Goldberger, 1981; Page and Keith, 1981; Ravitch, 1982; Walberg, 1982; Alexander et al., 1981; Alexander and Pallas, 1984; and the April 1982 issue of Sociology of Education). Reanalyses of the original data set have reported that the differences between private and public schools diminish or disappear when such variables as original student intake and curriculum placement are controlled (Noell, 1982; Willms, 1982; Peng, Owings and Fetters, 1982; Walberg and Shanahan, 1983).

Consequently, the school effects debate is at the point where it seems there may be some characteristics of schools which influence students. Nevertheless, since various studies tend to include different measures, we cannot be certain what characteristics are important.

Indicative of the confusion is the lack of agreement on what dimensions of effective schools are pertinent. In Anderson's (1982) review of the research on school climate, she mentions the following variables which have been found to be tied to student outcomes. (1) Ecology, including the material and physical aspects of the school such as decoration and care of the classrooms. (2) Milieu, such as teacher morale, student morale and student self-concept. (3) Social system variables or the patterned relationships of persons and groups such as the administrative organization or the flexibility of the instructional program. (4) Culture, which is the belief systems, values and meanings which students and teachers give to the daily school experience.

Others come up with different conceptualizations. Mackenzie (1983), for example, divides a list of 27 variables into the three categories of leadership dimensions, efficacy dimensions and efficiency dimensions. Peng, Owings, and Fetters (1982) conceptualize school resources, school policies and school practices. And, Ralph and Fennessey (1983) suggest that a five-factor model is relevant: (1) strong administrative leadership; (1) a safe and orderly school climate; (3) an emphasis on basic academic skills; (4) high teacher expectations for all students; and (5) a system for monitoring and assessing public performance.

Given the array of different conclusions relating to effective schools, it is appropriate to consider why it is so. In their review, Ralph and Fennessey (1983) caution readers to be aware of the wide-range of methodological problems in the empirical research on effective schools. The problems cited include observer bias, the lack of verifiable evidence for empirical claims and the omission of control variables, particularly students' social class backgrounds. Furthermore, they also caution that in some cases where standardized tests are used, increases in student scores are due to inadvertent teaching of test items or actual tampering while administering or processing the tests. While these methodological problems are serious and may contribute to some of the discrepancies reported above, there may be some underlying theoretical problems in the effective schools' research which have not been systemmatically tested.

James Rosenbaum argues that research tends to be "based on a faulty model of a single United States Educational System" (1984: 54). To assume all schools are alike overlooks not only the different grouping systems found among schools, but also the internal differentiation in the organization which occurs in response to community and student body characteristics. Hallinan and Sorenson (1983) emphasize the need to be sensitive to within-school differentiation as well as between-school differentiation. These comments are pertinent, because the majority of the research in the area of effective schools, particularly the quantitative research, has used global measures of school characteristics as the indicators of school influence without examining the particular school organization or environment of individual schools and the differential impact of such structures on different students.

The comments of Rosenbaum, and of Hallinan and Sorenson, suggest two revisions are in order in the basic model by which the effects of schools are studied. First, the schools, themselves, should be split into relevant subsamples before regressions are run, to check the possibility that the relationships of school context or school characteristics with student performance may be nonlinear. For example, the impacts which various school qualities have on learning may be somewhat different within high schools with a predominantly high-ability student body as compared to high schools with predominantly low-ability students.

Second, the effects of schools on subcategories of students also should be examined, exploring the possibility that school characteristics have a differential impact on different kinds of students. Such an impact would be concealed in analyses which aggregate students. While such a design is usually considered to be a "within-school differences" study, it really is not. A school which has certain characteristics which help academic track students to excel, for example, while the general track students are retarded, is demonstrating a school effect. Another school, which has no such effects, but in which the overall performance level has the same quantitative score as the school with the differential effects does not demonstrate a school effect, but rather reflects the result of student ability composition. The difference between these two cases is revealed only when calculating interaction effects, or when the samples are divided into relevant subcategories of students. We have chosen the latter for its ease of interpretation.

Consequently, this paper examines first the question of whether schools with mostly high-ability students have the same effect on students as do schools with a predominantly low-ability student body. Secondly, it explores whether students of different abilities might respond differentially to school characteristics in schools differing in student ability composition. Thus, the high-ability student in a low-ability school may be affected by a different array of school qualities and treatments than is the high- ability student in a high-ability school.

METHODS

The findings to be presented are based upon a quantitative analysis utilizing a multivariate model which employs repeated measures over time. The research is a panel design, using data on high school students collected in the High School and Beyond (HS&B) study. The analysis

examines the relationship of sophomore performance, social class origin, other student characteristics, and school-level variables to senior performance in mathematics and science. The students were surveyed and tested at two points in time (1980 and 1982), during their sophomore and senior years, by the National Opinion Research Center for the National Center for Education Statistics. The basic model employed in this study looks at the changes in student performance which occurred during the two-year time period, and measures the relationship of school characteristics to those changes.

Sample

The HS&B sample of students was selected through a two-stage stratified probability sample with over 1,100 schools selected in the first stage, and 36 students within each school as the second stage units. With the exception of certain special strata, which were oversampled, schools were selected with probability proportional to estimated enrollment in their 10th and 12th grades. The follow-up sample retained the essential features of a multistage, stratified, and clustered design. The response rate for those students still in school during the follow-up testing was 90 percent.

During the fall of 1982, high school transcripts were sought for a sample of 18,427 members of the 1980 sophomore cohort. Several categories of students were oversampled in the transcript sampling procedures. Weighting procedures were devised to take account of both differential selection probabilities for sample members and differential response rates for different types of schools and students. Eight-nine percent of the transcripts requested from the HS&B schools were received.

From the sample of students for whom transcript data are available, we drew a random sample of 3,921 cases. In addition, two other samples were drawn because there were not enough cases in the above sample to adequately represent the subcategories of high-ability students in low-ability schools and low-ability students in high-ability schools. The two additional samples include all students in those two groups, selected from the total HS&B sample of 29,737 students. In all analyses reported herein, appropriate weighting factors were applied to approximate the distributions of relationships in the population from which the sample was drawn. Because both sophomore and senior measures are used, only students who were still in high school during their senior year were included in the analyses.

Analysis Procedures

The basic statistical technique used for the study is multiple regression analysis. To measure changes over the two-year period, the typical regression predicts the senior year test performance by the sophomore year test performance. To eliminate the confounding influence of social class background, which is related to senior performance, a variable measuring this concept is included in the equations. Measures of sophomore performance (the scores on tests taken during the sophomore year) and social class background are entered in the first step of the regressions, with the school characteristics entered in the second step of the regression.

Senior performance is measured by scores on mathematics and science tests. The use of tests of mathematics and science performance as the dependent variables is advantageous because both subjects are less affected by home or media influence than are many of the other subjects studied in school.

Mathematics performance was measured by two tests each administered in both the sophomore and senior years. The first test, Math I, consists of 28 items and measures lower-level mathematics skills, those which are ordinarily learned before the student reaches high school. The second test, Math II, consists of 10 items and measures a higher level of mathematics skills, those which are usually learned from taking high school courses in mathematics. An analysis of the reliability and validity of the measures conducted by Heyns and Hilton (1982) concluded that the reliability of Math I, Math II and Science, which range from .54 to .84, meet conventional standards, and that the difficulty levels and timing are appropriate. Further, there is no problem introduced as a result of ceiling effects. Formula-scoring, used in the analysis reported here, tends to increase the variability of scores, and yield higher correlations between achievement and the independent variables of interest (Heyns and Hilton, 1982).

Number of courses taken in mathematics is a weighted index based upon the responses to four senior questions which asked whether or not the respondent had taken second-year algebra, calculus, geometry, and trigonometry. In order to index the level of advancedness of the courses, algebra was multiplied by one, geometry by two, trigonometry by three, and calculus by four; and then the resulting scores were added together to form a composite score.

The school variables included in the analysis fall into six categories: (1) school resources; (2) student body composition; (3) school atmosphere; (4) school treatments; (5) school disciplinary practices; and (6) classroom treatments. School-level variables are of three types: (1) individual reports of school treatments, such as how much influence the guidance counselor has on the student; (2) descriptions of the school given by the school principal; and (3) aggregated measures computed by calculating one score for all students in the school using the entire data file of 29,737 students. The school-level variables are described in Appendix A.

A word concerning the interpretation of the results is in order. By the sophomore year, it can be presumed that school influences have already been in effect for several years, and thus that whatever impact schools might have upon performance will already have begun. Therefore, the Beta weights and/or added variance explained which are obtained for the regressions covering the two-year period will be attenuated from those which might be obtained were the time span longer. It is reasonable to assume that they will be modest in size. Following conventional procedure, and as suggested by Cohen (1977), we shall consider any Beta weights over .10 to be worthy of notice, although any under .20 should be considered as representing a modest relationship.

Hypotheses

The central question to be addressed by the research is what characteristics of schools affect student performance in mathematics and science. In addition, we are interested in two subsidiary questions: (1) do the characteristics of schools which are important to the learning of mathematics and science differ in schools with varying student ability compositions; and (2) do school characteristics affect high- and low-ability students differentially?

RESULTS

Background Factors

Prior to analyzing school effects, the relationships of background variables to the dependent variables, senior mathematics and science performance, are presented in Table I. The first step of the regressions on Table I includes background variables of race, sex and social class. For both mathematics and science, race, sex, and social class are strongly related to senior performance. When sophomore performance is entered in the second step of the regression, the direct effect of the background variables drops considerably, although the standardized Beta coefficients for race and social class are still at or above .10 for science. These results indicate that the primary effects of these background variables are indirect, through their influence on sophomore performance.

School Characteristics

The third and fourth steps in the regressions on Table I include the standardized Beta coefficients for two school variables, curriculum placement and courses taken in mathematics and science. These show that curriculum placement has a small effect (Betas of .12 and .11), an effect which is further reduced in the fourth step of the regression when courses taken is included. Thus, the effect of curriculum placement appears to be indirect through its effect on courses taken. Courses taken, in turn, is related to senior performance for both mathematics and science, even when controlling for background characteristics and earlier performance.

To further explore the question of what characteristics of schools affect mathematics and science performance, regressions were run predicting senior test scores using variables measuring the six categories of school characteristics. These regressions controlled for sophomore performance and social class because both are highly correlated with senior performance. The regressions did not yield any school characteristics with a Beta over .10 for the total sample of students, while controlling for social class and earlier performance. These results seem to support the contention that there are no characteristics of schools which affect school performance other than courses taken and curriculum placement. A somewhat different conclusion emerges, however, from the examination of schools differentiated by ability-context, and of students grouped by ability level. To those analyses we now turn.

Schools Differentiated by Ability Context

Table II lists the same regressions as are in Table I, but the regressions are run separately for high- and low-ability schools. High

ability schools are schools in which the schools' composite index of scores on tests of reading, mathematics and writing are at or above the 75th percentile. Low ability schools are those schools in which the schools' composite index were at or below the 25th percentile.

The results show that the number of courses taken in the subject is somewhat stronger in relationship to senior performance in high-ability schools, than in low-ability schools. Curriculum placement is mostly predictive of senior science performance in low-ability schools, although there is a small indirect effect of curriculum placement on senior mathematics test scores in high- and low-ability schools. Most of the Betas for the background variables of race and social class and sex remain above .10 in the regressions for low-ability schools, while they are below .10 for high-ability schools (with the exception of race, which has a Beta of .11 in the regression for science.) This finding suggests that in low-ability schools, the environment of the school is not as conducive to overcoming the influence of student background characteristics on performance as compared to high-ability schools. This is supported by the stronger influence of background variables in the first step of the regressions for low-ability schools, as indicated by the slightly larger R Squares.

<u>Schools Differentiated by Ability Context as Well as Ability Level of Students</u>

Taking this explanation one step further, we looked at the same regressions for high- and low-ability students in high- and low-ability schools (see Table III). High ability students are those whose composite index scores were at or above the 75th pecentile, and low-ability students are those whose scores are at or below the 25th percentile. The results of this analysis are consistent with the findings on Table II in that the background variables, other than original performance, are stronger in relationship to senior mathematics and science performance in low-ability schools than in high-ability schools. However, in terms of the purposes of this paper, the more interesting relationships are found when comparing curriculum placement and number of courses taken for high- and low-ability students in high- and low-ability schools.

First, curriculum placement becomes particularly important among subgroups of students when predicting senior mathematics scores. In the mathematics regressions, the highest Betas for curriculum placement are found in the regressions for low-ability students in high-ability schools. Curriculum placement is initially related to senior mathematics scores for high-ability students in both high- and low-ability schools, but is reduced when number of mathematics courses is added to the regression.

In the regressions for science, curriculum placement is strongly related to senior performance only for low-ability students, regardless of the ability level of the school. Furthermore, the initial relationships between curriculum placement and senior science scores are not substantially reduced when number of courses taken in science is controlled.

When examining the relationship between courses taken in the subject and senior test scores, the strongest relationships for both mathematics and science are for high-ability students. However, the standardized Betas for number of mathematics courses taken by low-ability students are fairly strong. In fact, the Betas for number of mathematics courses taken by low-ability students are stronger than the Betas for number of science courses taken by high-ability students. The standardized Beta coefficients for the number of courses taken in the regressions predicting senior science performance for low-ability students are both below .10.

The reasons for the discrepancies in findings between mathematics and science are unknown and may lie in the nature of the course offerings, differences in the structure of the disciplines, or methodological issues. Since the results for mathematics are consistently higher, and not necessarily contradicted by the findings for science, we will continue these analyses using only regressions for senior mathematics performance.

Other School Characteristics

Table IV lists standardized Beta coefficients for those school characteristics which are related to senior test scores on the mathematics tests and courses taken in mathematics for high- and low-ability students in high- and low-ability high schools. Courses taken in mathematics is also included as a dependent variable in the analyses on Table IV, because courses taken was an important variable in Tables I, II and III. This finding is consistent with that of a companion study which found that the major impact of curriculum placement on cognitive growth is through its effect on courses taken (Vanfossen, Jones, and Spade: 1985). Consequently, by investigating what characteristics of schools affect courses taken in mathematics, we are also exploring the influence of schools on mathematics performance.

An obvious omission from Table IV is that we do not discuss characteristics of schools which affect curriculum placement. The reason for this is that curriculum placement is discussed in a second companion paper (Jones, Vanfossen, and Spade: 1985). Our findings provide support for the idea that schools may affect the placement of students in tracks by predetermining the number and proportion of students allocated to each track, thus the students will be assigned to tracks depending upon the distribution of student characteristics in the school.

The school characteristics included in Table IV are those variables which are correlated with the dependent variable at or above .10. All Betas listed in the table control for social class background and earlier performance. In addition, in those regressions including the aggregated composite ability measure for the school, the composite index for each student is also controlled.

As we compare these results on Table IV for all students to those for high- and low-ability students in high- and low-ability schools, we again find that school effects tend to be found when controlling for school ability context and the ability levels of the students. For example, none of the standardized Beta coefficients for school characteristics are above our cutoff point of .10 in predicting senior mathematics performance for high-ability schools, and only one variable is important in the same

regressions for all students in low-ability schools, that being volumes in the school library (.12). A similar pattern is found in the regressions for number of courses taken, when comparing the results for all students to the results for high- and low-ability students in high- and low-ability schools.

School Characteristics and Senior Mathematics Performance

In examining Table IV, it is clear that the school characteristics are not highly related to cognitive growth in mathematics and science. We did not expect to find large effects given that the growth we are measuring is only over a two-year period. Even so, there are several patterns worthy of note in these results for senior mathematics performance.

First, no variables within our categories of school atmosphere or classroom treatments are related to senior mathematics performance for any of the groups analyzed. In addition, only three measures of school disciplinary practices are related to senior mathematics performance: number of school rules for high-ability students in high-ability schools (.12); number of students referred to administrators for low-ability students in low-ability schools (.18); and time lag in recognizing AWOL students for high-ability students in low-ability schools (.12).

On the other hand, school treatments, school resources and student body composition do seem to relate to senior mathematics performance. In terms of school treatments, for high-ability students in high-ability schools, senior mathematics scores are related to two measures of guidance counselor influence (-.10 and .15), to competency test requirements (-.16); and to the availability of trigonometry (-.23). However, low-ability students at high-ability schools do not do as well on senior mathematics tests if trigonometry is taught (.18). Senior mathematics performance of high-ability students in low-ability schools is related to whether calculus is taught (-.17) and if 12th grade English classes are ability grouped (-.10); low-ability students in low-ability schools do better when advanced placement courses are offered (-.18).

School resources are slightly more predictive of senior mathematics scores for low-ability students, but the results are somewhat contradictory. That is, low-ability students in high-ability schools have higher senior mathematics test scores if the per pupil expenditure for the district is lower (-.14) and if remedial instruction is not available (.15). Low-ability students in low-ability schools have higher mathematics scores if there are more volumes in the library (.23) and if there is not a teaching resource center (.11). It may be that when additional resources are found in schools, these resources get funneled toward the higher achieving students or used in ways which emphasize the poor achievement level of the low achievers, thus these students gain little. This conclusion is supported by the fact that high-ability students in high-ability schools do better on the senior mathematics tests when there is a remedial reading or mathematics lab (-.15). The last school resource which affects students is the length of the school year, that is, high-ability students in low-ability schools score lower on the senior mathematics test when the year is longer.

In terms of student body composition, the cognitive growth in

mathematics of high-ability students in high-ability schools is greater when there is a smaller number of students in the school (-.14), and when the ability level of students in the school is higher (.11). Students in low-ability schools, on the other hand, are more affected by the percentage of students in various academic programs. The cognitive growth in mathematics of high-ability students in high-ability schools is reduced if there is a larger percentage of 10th grade students in trade (-.11) or technical (-.12) programs. Low-ability students in low-ability schools do better if there are more students in the general program (.14 and .13). It is curious that the program placement affects students in low-ability schools. In a sense, the percentage of students in particular programs is less a school composition variable and more an artifact of school treatments. If programs are not available or if the distribution of programs is skewed, then the resultant composition of the curricular tracks affects senior mathematics performance for students in low-ability schools.

School Characteristics and Number of Mathematics Courses Taken

In turning to those regressions predicting number of mathematics courses taken, we again find that school treatments are quite important. It is interesting that guidance counselor influence is related to number of mathematics courses taken for all students, regardless of the ability level of the student or the ability context of the school. Requiring more mathematics and science courses for the college preparatory program increases number of mathematics courses taken in high-ability schools (.10 and .10). If 12th grade English classes are grouped by ability, the number of mathematics courses taken by low-ability students in high-ability schools are reduced (.10), but the number of mathematics courses taken by high-ability students in low-ability schools is increased (-.11). Lastly, whether certain mathematics courses are offered is an important determinant of whether students take courses, particularly among high-ability students in low-ability schools.

The results from the regressions predicting number of mathematics courses taken using student body composition are similar to those found in the earlier regressions predicting cognitive growth in mathematics. The measures which relate to number of mathematics courses taken in low-ability schools tend to be those which reflect the distribution of students into particular curricular tracks. High-ability students in high-ability schools, on the other hand, take more mathematics classes when the school is smaller (-.20) and when students are of higher average ability (.13), but take fewer courses if there are more students in the general track in 10th and 12th (-.14 and -.14) grades. Low-ability students in high-ability schools take more mathematics courses if there are more blacks (.18) and Hispanics (.12) in the school, if the average ability level of students in the school is higher (.12) and if the average social class background of students in the school is higher (.11); but take fewer classes if there are more students in the general track (-.15 and -.11). On the other hand, the low-ability students in the low-ability schools take more mathematics classes if there are more students in the general track (.12 and .11). Both high- and low-ability students in low-ability schools take more mathematics classes if there are more students in the academic track. The low-ability students in the low-ability schools are affected by the distribution of students in four different curricular tracks -- trade, business, general and academic. In addition, these low-ability students in

low-ability schools take fewer mathematics classes if the percentage in remedial mathematics is higher (-.15) and if the average ability level of students in the school is lower (-.10).

As before, we again find contradictions in the results of the resgressions run using variables measuring school resources, particularly among low-ability students in low-ability schools. The number of courses taken by these students increases if the school has more assistant principals and deans (.14) and a program for the giften (-.12), but declines if the faculty/student ratio is higher (-.11) and if there is a teaching resource center (.12). Low-ability students in high-ability schools take fewer courses if there are more minutes in the day (-.10). High ability students in high-ability schools take more courses if the faculty/student (.12) and the administrator/teacher (.11) ratios are higher, if there is a remedial reading or math laboratory, and if the first step on the teacher's salary is lower (-.18).

Classroom treatments also affect number of mathematics courses taken. Feeling that others see you as important relates to taking more mathematics courses for all categories of students except the high-ability students in the low-ability schools. In fact, none of the interactional variables reflecting classroom treatments relate to the number of mathematics courses taken by high-ability students in low-ability schools. They are important for the other students, especially for the low-ability students in the high-ability schools.

School atmosphere also influences the number of courses taken. If the principal felt that one of the school goals was to prepare students for further schooling, then high-ability students in the high-ability schools (-.15) and low-ability students in the low-ability schools were likely to take more courses. Emphasis on developing critical thinking increased the number of mathematics courses taken by low-ability students in high-ability schools. Verbal confrontation among teachers decreases number of mathematics courses taken by low-ability students in low-ability schools. If homework is assigned, the number of mathematics courses increases for all groups but the low-ability students in the low-ability schools.

Fair and strict discipline seems to increase the number of mathematics courses taken within all of the subgroups studied with one exception. High-ability students in low-ability schools take fewer courses if there are more school rules (-.14).

CONCLUSION

In conclusion, we have to ask what does this mean? Do characteristics of schools affect student performance in mathematics and science? The results presented herein suggest that the answer is an affirmative. However, the impact of schools on students must be considered in the context of the school and the student. Rosenbaum (1984) expressed it well when he said that there is not a single United States Educational System. Just as all schools are not alike, nor are all students alike. Schools respond to the many different inputs from the community in which they serve, and students respond to where they fit in the social organization of the school.

The results on Tables II, III and IV support the argument that there are some school effects which are contextually based in the different environments of high- and low-ability schools as well as in differential experiences of high- and low-ability students in those schools. To overlook these two contexts serves to average out the influence of school characteristics on student learning. Furthermore, the results of Table IV illustrate the various effects of school characteristics in different learning environments. While it appears that school characteristics affect students differently, based upon the ability level of the student and the ability level of others in the school, we need to continue to explore the particular patterns of these effects.

We believe that the various patterns which are evident in these analyses require serious consideration of the context of learning. If we think of students in schools in terms of a frog pond, even the anomolies in these findings begin to make sense. Low-ability students have particular needs, not the least of which is preservation of their egos. These students tend to achieve higher cognitive levels in mathematics when schools do not accentuate their weakness, but instead provide a favorable academic environment — supportive teachers and guidance counselors who expect them to go on to college. However, low-ability students also respond to the school in which they learn. For example, a larger proportion of students in the academic and general tracks increases cognitive performance and number of mathematics courses taken for low-ability students in low-ability schools, but a larger percentage of students in the general track decreases number of courses taken for those same students in high-ability schools. Being in a general ability track may have very different meanings in these two contexts. To a student in a high-ability school, it may indicate that those students are not able to achieve what the others in the school are capable of. To a student in a low-ability school, being in a general track may mean that those students could go on to college, therefore, encouraging students to learn.

The situation of high-ability students is quite different. These students also need encouragement from teachers and guidance counselors, yet such encouragement is less important than meeting certain structural needs. Consider the fact that high-ability students in low-ability schools are not influenced by classroom treatments, but are influenced more than the other groups by school treatments, particularly the courses which are taught. Conversely, high-ability students in high-ability schools respond to all of the characteristics of schools which seem to increase learning — smaller schools, lower student/teacher ratios, higher average ability level of peers, availability of extra help, and supportive teachers who are interested in students. It may be that such school characteristics are meaningless unless other needs are met, both from the context of the individual as a person and the individual as he or she reacts to the organization of the school.

In conclusion, this research opens the door for further examination of school effects. The findings presented here should be sufficient warning that we cannot look at the effects of schools on student performance without also examining the contextual effects relative to the school environment and the relationship of the individual to that social situation.

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APPENDIX A

ITEMS USED IN CONSTRUCTION OF MEASURES AND CODING

Control Variables

Family socioeconomic background: A composite score, based on family income, father's education, mother's education, father's occupation, and 8 household items. Scores included for every student who gave information on at least two of the items. From the 1980 Sophomore questionnaire. High scores indicate high socioeconomic status.

Race and ethnic origin codes: A composite score was constructed based on responses to questions in 1980 and 1982 concerning both ethnicity and race. For the race dummy 1 used in this analysis, the variable was coded 1 if race=Black, 0 if race=White, and -1 if race=Hispanic or Spanish. For Race Dummy 2, a code of 1 indicates that race=White, 0 indicates that race=Black, and -1 indicates that race=Hispanic or Spanish.

Sex is coded 1=male, 2=female.

Performance Measures

Mathematics and science performance are discussed in text of paper.

Curriculum Placement Students were asked in both their sophomore and their senior years their track location. To determine track, we compared the responses in these two years. If the responses were consistent, we coded track in line with those consistencies. Students who indicated in their senior year that they were in the academic track were coded as being in the academic track, regardless of their sophomore statement. However, if they indicated in their sophomore year that they were in the academic track, and in their senior year that they were in the general, then we inspected the number of foreign language courses which they had taken (according to their transcripts). Those who had take two or more years of foreign language were then coded as being in the academic track. Ten percent of the students were thus shifted from being classified as general track students according to the senior self-reports to being classified as academic track students. The resulting percentages then are very similar to the percentages given by the principals of the high schools as to the relative distribution of students in the various tracks (see Willms, 1982, for a similar adjustment using educational expectations).

The nominal scale coding used for coding track location for the regression analysis is one created by "effects coding" (Cohen and Cohen, 1983), according to which Track Variable 1 is coded 1 if the student's track placement is academic, 0 if it is general, and -1

if it is vocational; and according to which Track Variable 2 is coded 1 if the student's track placement is general, 0 if it is academic and -1 if it is vocational. Effect coding is particularly appropriate for nominal scales when each group is most conveniently compared with the entire set of groups, rather than with a single reference group, as is facilitated by dummy-variable coding. The effects on the R2 are the same in either case.

Number of Courses Taken in Mathematics and Science

Number of mathematics and science courses take are discussed in text of paper.

School Resources

Minutes per day in school: A single score representing the product of length of class period in minutes times number of class periods in a school day. SB006*SB007.

Length of school year: Number of days in the school year, from School Questionnaire. SB005.

Number of assistant principals and deans on the high school staff, from School Questionnaire. SB039A.

Number of classroom teachers on the high school staff, from School Questionnaire. SB039C.

Number of volumes in school library, from School Questionnaire. SB028.

Teacher/student ratio: the number of classroom teachers divided by total high school members. Data from School Questionnaire. SB039C/SB002A.

Administrator/teacher ratio: the number of assistant principals and deans on the high school staff divided by the number of teachers. From School Questionnaire. SB039A/SB039C.

District average per pupil expenditure: from School Questionnaire. SB053A.

Teacher salary: From School Questionnaire, indicating the first step on an annual salary contract schedule for a beginning certified teacher with a bachelor's degree. SB047.

Availability of departmental offices, teaching resources center, and remedial reading or math laboratory for teachers. From School Questionnaire. Lower codes indicate the facility is available. SB027G, SB027H, and SB027E.

Number of remedial specialists on school staff. From School Questionnaire. SB039E.

Availability of programs for the gifted and talented. From School Questionnaire. SB029AI. Low codes indicate availability.

Availability of remedial basic skills instruction. From School Questionnaire. FS13AP. Low codes indicate availability.

Student Body Composition

Percent of high school students who are Black: From School Questionnaire. SB0094S.

Percent of high school students who are Hispanic: From School Questionnaire. SB0093S.

Average level of student ability in the school: an aggregated variable created by averaging the scores of all students in the school on a composite index of ability (tests of reading, vocabulary, and mathematics).

Average level of student socioeconomic background in the school: an aggregated variable created by averaging the scores of all students in the school on a composite index of socioeconomic background.

Percentage of students in general, academic, business, trade, and technical programs in 10th and 12th grades. From School Questionnaire. Items SB017AE to SB017C7Y.

Percent of 10th grade students taking remedial work in mathematics. From School Questionnaire. SB022.

School Atmosphere

Problem of conflicts between students and teachers, of verbal abuse of teachers, and of verbal confrontation among teachers. From School Questionnaire. Low scores indicate a serious problem. SB056N, SB056H and FS37B.

Importance of high school goals: developing students' abilities to solve problems and think critically; and prepare students for further schooling -- college, junior college, or technical school. From School Questionnaire. Low scores indicate the goals are very important. FS42E and FS42G.

Percentage of time when homework is not assigned. Aggregated from student questionnaire. High scores indicate high percentage of students in the school reported that no homework was ever assigned. Two items aggregated, one based on Sophomore data, one on Senior data.

Number of colleges who sent a representative to talk with interested students. From School Questionnaire. SB038.

School Treatments

How placed in high school program. From Sophomore and Senior Questionnaires. 1="I was assigned," 2="I chose it myself." YB002 and FY3A.

Influence of counselor or teacher on choice of high school program. From Senior Questionnaire. 1 indicates student chose it after talking with counselor or teacher, 2 indicates that was not the case. FY3B.

Amount of influence of guidance counselor in plans for after high school. High scores indicate a great deal. FY62C.

Amount student talked to guidance counselor about planning the school program. High scores indicate a great deal. YB049C.

Aggregated level of expectation of guidance counselors that students in the school will go to college. The overall percentage of Sophomores and Seniors in each school who indicated that a guidance counselor though they ought to go to college.

Requirement that seniors pass a minimum competency test in order to receive a diploma. From School Questionnaire. Low scores indicate that requirement exists. SB023.

Number of courses in mathematics and science required for students enrolled in a college preparatory program. From School Questionnaire. FS40A and FS40B.

Availability of courses in second-year algebra, calculus, geometry, trigonometry, and physics. From School Questionnaire. 1 indicates that the course is available, 2 indicates that it is not. SB018A through SB018P.

Availability of College Board Advanced Placement Courses. From School Questionnaire. Low score indicates program is available. SB029AD.

Presence of homogeneous ability or achievement grouping in English classes. From School Questionnaire. Low score indicates yes. SB020.

School Disciplinary Practices

Aggregated student rating of fairness of discipline in the school. Average scores computed from responses of all students in the school on FY67H.

Number of school rules. Sum of rules indicated by principal that school has concerning hall passes required, smoking, student dress, and materials brought to class. From School Questionnaire. FS26C through FS26H.

Number of misbehaving students referred to school administrators in a given week. From School Questionnaire. FS27.

In school suspension used in the school. 1 indicates yes, 2 indicates no. FS23

Length of time before school administration knows that a student is absent, or has left school without permission. From School Questionnaire. FS20 and FS21.

Percentage of the teachers who are very strict about discipline in their classrooms. From School Questionnaire. FS29.

Students are put on probation for disciplinary or academic problems. 1 indicates yes, 2 indicates no. FS24.

Classroom Treatments

Aggregated student responses concerning the qualities of teachers. Scores were averaged across all students in the school. Students were asked about the number of teachers who: enjoy work, gives clear explanations, works you hard, respect students, are witty, are not over the head of students, are patient. Low scores indicate most teachers have these characteristics. Aggregation from FY69A through FY69G.

Aggregated student scores on questions asking students to rate the school on the level of teacher interest in students (both Sophomores and Seniors). Low scores indicate most teachers have these characteristics. Aggregation from FY67E and BB053E.

TABLE I

Regressions Predicting Senior Mathematics and Science Test Scores
Using Background Variables, Track and
Mathematics and Science Courses Taken
Standardized Regression Coefficients1/

SENIOR MATHEMATICS TEST SCORE

R Square	.22	.71	.72	.76
Race-2	.25	.04	.05	.07
	(4.01)	(.71)	(.86)	(1.15)
Race-1	-.06	.01	.00	-.02
	(-1.42)	(.28)	(.09)	(-.40)
Sex	-.12	-.05	-.05	-.05
	(-2.51)	(-1.15)	(-1.15)	(-1.13)
SES Background	.32	.09	.07	.03
	(2.53)	(.69)	(.53)	(.25)
Soph. Math Score		.78	.75	.60
		(.87)	(.84)	(.67)
Track-1			.12	.06
			(1.46)	(.73)
Track-2			-.03	-.01
			(-.46)	(-.17)
Courses in Math				.28
				(.66)

SENIOR SCIENCE TEST SCORE

R Square	.23	.55	.56	.58
Race-2	.32	.12	.13	.14
	(2.18)	(.84)	(.88)	(.93)
Race-1	-.14	-.07	-.07	-.08
	(-1.35)	(-.64)	(-.70)	(-.78)
Sex	-.16	-.06	-.06	-.05
	(-1.39)	(-.51)	(-.51)	(-.45)
SES Background	.25	.10	.08	.06
	(.81)	(.32)	(.25)	(.19)
Soph. Science		.64	.62	.58
Score		(.65)	(.63)	(.58)
Track-1			.11	.07
			(.56)	(.34)
Track-2			-.02	-.01
			(-.17)	(-.07)
Courses in Science				.15
				(.33)

1/ The values within the parentheses are unstandardized regression coefficients.

TABLE II

Regressions Predicting Senior Mathematics and Science Test Scores Using Background Variables, Track and Mathematics and Science Courses Taken Controlling for Ability Level of the High School Standardized Regression Coefficients1/

SENIOR MATHEMATICS TEST SCORE

	HIGH ABILITY SCHOOLS				LOW ABILITY SCHOOLS			
R Square	.16	.69	.70	.75	.17	.62	.63	.66
Race-2	.15	.03	.02	.03	.33	.07	.08	.14
	(3.54)	(.64)	(.57)	(.80)	(3.34)	(.71)	(.81)	(1.39)
Race-1	-.05	-.01	-.00	-.01	-.10	.02	.01	-.03
	(-1.85)	(-.29)	(-.13)	(-.45)	(-1.09)	(.21)	(.10)	(-.38)
Sex	-.18	-.03	-.03	-.03	-.17	-.15	-.14	-.14
	(-3.76)	(-.62)	(-.63)	(-.61)	(-2.82)	(-2.48)	(-2.43)	(-2.40)
SES Background	.31	.09	.08	.03	.18	.05	.04	.01
	(2.44)	(.74)	(.61)	(.22)	(1.32)	(.38)	(.31)	(.09)
Soph. Math Score		.79	.76	.62		.73	.72	.59
		(.88)	(.86)	(.70)		(.83)	(.81)	(.67)
Track-1			.12	.05			.10	.06
			(1.59)	(.60)			(.94)	(.59)
Track-2			-.07	-.05			-.04	-.01
			(-1.22)	(-.88)			(-.48)	(-.12)
Courses in Math				.29				.23
				(.64)				(.59)

SENIOR SCIENCE TEST SCORE

	HIGH ABILITY SCHOOLS				LOW ABILITY SCHOOLS			
R Square	.11	.54	.54	.57	.24	.52	.53	.55
Race-2	.20	.10	.10	.11	.39	.09	.11	.14
	(1.81)	(.94)	(.94)	(1.03)	(2.10)	(.48)	(.58)	(.74)
Race-1	-.08	-.06	-.06	-.08	-.20	-.10	-.11	-.11
	(-1.19)	(-.90)	(-.87)	(-1.10)	(-1.21)	(-.59)	(-.65)	(-.72)
Sex	-.22	-.04	-.04	-.03	-.13	-.07	-.08	-.07
	(-1.71)	(-.29)	(-.29)	(-.20)	(-1.18)	(-.67)	(-.67)	(-.61)
SES Background	.17	.06	.05	.01	.24	.16	.14	.13
	(.50)	(.19)	(.16)	(.04)	(.92)	(.62)	(.53)	(.49)
Soph. Science		.70	.69	.64		.61	.59	.56
Score		(.70)	(.70)	(.65)		(.63)	(.60)	(.57)
Track-1			.02	.03			.15	.13
			(.10)	(.19)			(.74)	(.62)
Track-2			.01	-.03			-.02	-.01
			(.09)	(-.17)			(-.14)	(-.06)
Courses in Science				.19				.12
				(.35)				(.33)

1/ The values within the parentheses are unstandardized regression coefficients.

TABLE III (Continued)

Regressions Predicting Senior Mathematics and Science Test Scores
Using Background Variables, Track and
Mathematics and Science Courses Taken
Controlling for Ability Level of the High School
And Ability Level of the Student
Standardized Regression Coefficients1/

SENIOR SCIENCE TEST SCORE

	HIGH ABILITY SCHOOLS								LOW ABILITY SCHOOLS							
	High Ability Students				Low Ability Students2/				High Ability Students2/				Low Ability Students			
R Square	.04	.41	.42	.44	.06	.19	.21	.22	.13	.34	.35	.36	.07	.17	.19	.19
Race-2	.03	.01	.01	.02	.18	.13	.17	.17	.26	.17	.18	.19	.06	-.00	.01	.03
	(.26)	(.07)	(.06)	(.14)	(.[illegible]8)	(.64)	(.80)	(.82)	(1.29)	(.85)	(.92)	(.95)	(.27)	(-.02)	(.04)	(.12)
Race-1	.02	.01	.02	.02	-.09	-.06	-.08	-.09	-.22	-.17	-.18	-.19	-.09	-.09	-.11	-.11
	(.31)	(.14)	(.19)	(-.01)	(-.67)	(-.40)	(-.61)	(-.65)	(-1.52)	(-1.18)	(-1.21)	(-1.28)	(-.34)	(-.34)	(-.40)	(-.41)
Sex	-.21	-.08	-.08	-.07	-.13	-.14	-.15	-.15	-.20	-.09	-.10	-.09	-.21	-.16	-.15	-.15
	(-1.10)	(-.43)	(-.45)	(-.35)	(-1.00)	(-1.03)	(-1.14)	(-1.14)	(-1.30)	(-.61)	(-.67)	(-.56)	(-1.38)	(-1.03)	(-.99)	(-1.00)
SES	-.02	-.07	-.05	-.06	.08	.02	-.00	-.01	.05	-.03	-.04	-.06	.14	.10	.10	.10
	(-.04)	(-.14)	(-.10)	(-.13)	(.23)	(.06)	(-.01)	(-.03)	(.12)	(-.08)	(-.11)	(-.16)	(.47)	(.32)	(.34)	(.33)
Soph. Sci.		.62	.63	.61		.37	.35	.35		.49	.47	.46		.33	.33	.32
		(.58)	(.60)	(.56)		(.41)	(.39)	(.39)		(.53)	(.51)	(.50)		(.37)	(.37)	(.37)
Track-1			-.05	-.08			.13	.12			.08	.05			.17	.16
			(-.24)	(-.41)			(.64)	(.58)			(.37)	(.21)			(.60)	(.56)
Track-2			-.07	-.04			-.19	-.19			- .01	-.02			-.14	-.13
			(-.44)	(-.27)			(-.80)	(-.82)			(-.08)	(-.11)			(-.59)	(-.55)
Science Courses				.15				.07				.11				.07
				(.19)				(.19)				(.17)				(.14)

1/ The values within the parentheses are unstandardized regression coefficients.
2/ These are special samples which include all students in that category from the HS&B sample.

TABLE III

Regressions Predicting Senior Mathematics and Science Test Scores
Using Background Variables, Track and
Mathematics and Science Courses Taken
Controlling for Ability Level of the High School
And Ability Level of the Student
Standardized Regression Coefficients1/

SENIOR MATHEMATICS TEST SCORE

	HIGH ABILITY SCHOOLS								LOW ABILITY SCHOOLS							
	High Ability Students				Low Ability Students2/				High Ability Students2/				Low Ability Students			
R Square	.06	.43	.47	.54	.07	.23	.27	.32	.06	.49	.53	.59	.12	.34	.34	.37
Race-2	-.02	-.04	-.03	-.01	.12	.07	.11	.12	.01	-.01	.01	.06	.17	.14	.14	.17
	(-.45)	(-.80)	(-.59)	(-.17)	(1.03)	(.58)	(.92)	(1.02)	(.07)	(-.13)	(.13)	(.75)	(1.13)	(.94)	(.98)	(1.18)
Race-1	.06	.04	.03	.02	-.05	-.02	-.06	-.08	-.10	-.06	-.06	-.09	-.06	-.01	-.02	-.03
	(1.98)	(1.28)	(1.00)	(.69)	(-.58)	(-.28)	(-.75)	(-1.08)	(-1.72)	(-1.02)	(-1.13)	(-1.63)	(-.36)	(-.08)	(-.12)	(-.16)
Sex	-.11	.05	.03	.02	-.02	-.06	-.07	-.08	-.15	-.01	-.03	-.03	-.31	-.26	-.26	-.24
	(-1.51)	(.68)	(.37)	(.20)	(-.28)	(-.81)	(-.93)	(-1.04)	(-2.42)	(-.13)	(-.50)	(-.45)	(-3.32)	(-2.77)	(-2.74)	(-2.54)
SES	.21	.10	.10	.06	.23	.20	.14	.09	.17	.01	-.02	-.06	.04	.04	.04	.01
	(1.05)	(.53)	(.50)	(.30)	(1.21)	(1.05)	(.74)	(.49)	(1.07)	(.05)	(-.13)	(-.39)	(.20)	(.21)	(.22)	(.05)
Soph. Math		.64	.65	.52		.40	.40	.33		.69	.67	.54		.48	.48	.44
		(.71)	(.72)	(.58)		(.56)	(.55)	(.46)		(.94)	(.91)	(.74)		(.57)	(.57)	(.53)
Track-1			.15	.04			.24	.13			.20	.09			.05	.02
			(1.81)	.51)			(2.05)	(1.14)			(2.21)	(.97)			(.30)	(.10)
Track-2			-.17	-.14			-.12	-.09			-.03	-.02			-.04	-.02
			(-2.81)	(-2.32)			(-.87)	(-.68)			(-.49)	(-.24)			(-.29)	(-.09)
Math Courses				.32				.27				.31				.19
				(.50)				(.61)				(.58)				(.46)

1/ The values within the parentheses are unstandardized regression coefficients.
2/ These are special samples which include all students in that category from the HS&B sample.

TABLE IV

SUMMARY OF REGRESSIONS PREDICTING
SENIOR MATH TEST SCORES AND MATH COURSES TAKEN
USING SCHOOL CHARACTERISTICS 1/

ABILITY LEVEL:	SENIOR MATH TEST SCORES						COURSES TAKEN						
OF SCHOOL	HIGH	HIGH	HIGH	LOW	LOW	LOW	ALL	HIGH	HIGH	HIGH	LOW	LOW	LOW
OF STUDENTS	ALL	HIGH	LOW	ALL	HIGH	LOW	ALL	ALL	HIGH	LOW	ALL	HIGH	LOW
SCHOOL RESOURCES													
Minutes per day					.01 (.002)					-.10 (.008)			
Length of School Year	-.01 (-.04)				-.10 (-.13)			-.03 (-.04)					
No. Asst. Prin. & Deans													.14 (.14)
No. of Teachers			-.05 (-.009)								.09 (.06)		
No. of Volumes in Lib.				.12 (.0001)		.23 (.0001)					.10 (.0000)		.07 (.0004)
Teacher/Student Ratio	.02 (4.77)							.07 (9.63)	.12 (14.0)		-.10 (-10.0)		-.11 (-6.93)
Administrator/Teacher Ratio		.08 (11.44)							.11 (10.27)				
District Per Pupil Exp.		-.02 (-.000)	-.14 (-.001)				.06 (.0005)	.09 (.0006)	.08 (.0005)			.07 (.0004)	
First Step on Teachers' Salary									-.18 (-.001)	-.09 (-.000)			
Departmental Offices2/	-.05 (-.15)		.00 (.02)				-.04 (-.05)	-.04 (-.06)	-.07 (-.09)		-.03 (-.03)	-.13 (-.16)	
Teaching Resource Center2/		-.08 (-.18)				.11 (.22)							.12 (.10)
No. Remedial Specialists		.00 (.006)				-.04 (-.07)							
Remedial Reading/Math Lab2/		-.15 (-.51)							-.14 (-.30)		-.07 (-.13)		
Remedial Instruction Available2/	.01 (.22)		.15 (2.66)	.08 (2.02)		-.04 (-.74)							
Program for Gifted2/					-.08 (-1.30)						-.05 (-.31)		-.12 (-.51)

1/ The values within the parentheses are unstandardized regression coefficients.
2/ These variables are reverse coded, see description of variables in Appendix A.

TABLE IV (Continued)

SUMMARY OF REGRESSIONS PREDICTING
SENIOR MATH TEST SCORES AND MATH COURSES TAKEN
USING SCHOOL CHARACTERISTICS

ABILITY LEVEL OF SCHOOL OF STUDENTS	SENIOR MATH TEST SCORES HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW	COURSES TAKEN ALL ALL	HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW
STUDENT BODY COMPOSITION													
No. of Students in School		-.14 (-.001)	-.01 (-.000)						-.20 (-.001)		.08 (.0003)		.08 (.0002)
% Black in School				-.03 (-.008)						.18 (.06)			
% Hispanic in School					.07 (.03)					.12 (.07)			
Avg. Student Ability	.05 (.26)	.11 (.30)		.04 (.16)			-.02 (-.02)	.11 (.25)	.13 (.22)	.12 (. 30)			-.10 (-.10)
Avg. Student Social Class	.06 (1.94)	.08 (1.54)		.06 (2.02)	.06 (.05)		.00 (.11)	.11 (1.60)	.06 (.76)	.11 (1.09)			
% 10th Gr. in Academic		.08 (.007)					.03 (.002)					.14 (.03)	.08 (.006)
% 12th Gr. in Academic		.08 (.007)					.03 (.003)					.12 (.02)	.10 (.007)
% 10th Gr. in General	-.05 (-.01)					.14 (.007)		-.10 (.006)	-.14 (-.007)	-.15 (-.01)			.12 (.002)
% 12th Gr. in General	-.06 (-.01)				.13 (.006)			-.11 (-.007)	-.14 (-.008)	-.11 (-.01)			.11 (.002)
% 10th Gr. in Business				.09 (.06)	.02 (.02)							.08 (.03)	-.14 (-.02)
% 12th Gr. in Business												.10 (.04)	
% 10th Gr. in Trade					-.11 (-.06)							-.09 (-.03)	.13 (.02)
% 10th Gr. in Technical					-.12 (-.17)								
% 10th Gr. in Remedial Math													-.15 (-.001)

TABLE IV (Continued)

SUMMARY OF REGRESSIONS PREDICTING
SENIOR MATH TEST SCORES AND MATH COURSES TAKEN
USING SCHOOL CHARACTERISTICS 1/

ABILITY LEVEL OF SCHOOL / OF STUDENTS	SENIOR MATH TEST SCORES						COURSES TAKEN						
	HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW	ALL ALL	HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW
SCHOOL ATMOSPHERE													
Verbal Abuse of Teachers2/					.05 (.83)			.05 (.43)			-.13 (-.79)		
Verbal Confrontation Among Teachers - Frequency													-.16 (-1.01)
Conflicts between Students and teachers 2/					.05 (.91)	-.07 (-.75)		.08 (.73)				.07 (.66)	
Goals: Prepare for Further Schooling2/							-.09 (-.77)	-.15 (-1.53)	-.13 (-1.19)		-.16 (-.99)		-.26 (-1.04)
Goals: Critical Thinking2/										-.11 (-.68)			
No Homework Assigned - from Sophomore Survey2/	-.05 (-.20)						-.02 (-.03)	.00 (.00)				-.12 (-.10)	
No Homework Assigned - from Senior Survey2/	-.03 (-.11)						-.04 (-.03)	-.05 (-.07)	-.11 (-.17)	-.13 (-.12)		-.20 (-.14)	
Colleges Send Reps.		.03 (.29)	-.08 (-.80)				.04 (.18)					.09 (.34)	
SCHOOL TREATMENTS													
Assigned to Program2/		-.07 (-.94)		.00 (.02)	.01 (.25)				-.08 (.76)				
Guidance Counselor Inf.				.01 (.06)	.05 (.55)	.07 (.02)			.09 (.71)	.14 (.57)		.11 (.71)	
Planned Program with Guidance Counselor		-.10 (-1.03)										.12 (.84)	
Chose Program after talk with Guidance Counselor2/					-.09 (-1.67)							-.08 (-.82)	
ASR - Guidance Coun. Expects You to Go to College (Soph)	.03 (.02)	-.02 (-.01)					.11 (.03)	.12 (.03)	.11 (.03)	.15 (.03)	.15 (.04)	.11 (.04)	.15 (.02)
" " " " (Senior)	.09 (.06)	.15 (.06)					.15 (.04)	.24 (.07)	.30 (.08)		.18 (.04)		.13 (.02)

TABLE IV (Continued)

SUMMARY OF REGRESSIONS PREDICTING
SENIOR MATH TEST SCORES AND MATH COURSES TAKEN
USING SCHOOL CHARACTERISTICS 1/

ABILITY LEVEL	SENIOR MATH TEST SCORES						COURSES TAKEN						
OF SCHOOL	HIGH	HIGH	HIGH	LOW	LOW	LOW	ALL	HIGH	HIGH	HIGH	LOW	LOW	LOW
OF STUDENTS	ALL	HIGH	LOW	ALL	HIGH	LOW	ALL	ALL	HIGH	LOW	ALL	HIGH	LOW
SCHOOL TREATMENTS (Cont.)													
Minimum Competency Test2/		-.16											
		(-2.72)											
No. of Math Courses													
Required for College	.05							.10					
Preparatory Program	(.31)							(.30)					
" " " Science Courses	.06	.08						.10		.08			
	(.37)	(.32)						(.29)		(.15)			
Courses Taught:													
Geometry2/									-.10			-.10	
									(-5.77)			(-3.60)	
2nd Year Algebra2/													.14
													(2.73)
Calculus2/					-.17		-.06	-.07	-.07	-.11		-.19	
					(-2.79)		(-.58)	(-.79)	(-.73)	(-.73)		(-1.70)	
Trigonometry2/	-.08	-.23	.18		-.08			-.07	-.20			-.09	
	(-2.19)	(-4.41)	(3.58)		(-1.55)			(-.92)	(-2.57)			(-.98)	
Physics2/		-.07				.03						-.18	
		(2.46)				(.56)						(-2.82)	
AP Courses Offered2/	-.05	-.03				-.18	-.06	-.07	.01			-.09	
	(-1.03)	(-.38)				(-2.04)	(-.58)	(-.67)	(-.06)			(-.79)	
12th Gr. English					-.10					.10		-.11	
Ability Grouped2/					(-1.57)					(.57)		(-.12)	
SCHOOL DISCIPLINARY PRACTICES													
ASR - Discipline Fair	-.01	.03						.04	.06	.12			.15
	(-.38)	(.59)						(.62)	(.76)	(1.31)			(.95)
No. of School Rules	.04	.12			-.05			.02	.10			-.14	
	(.40)	(.85)			(-.48)			(.08)	(.44)			(-.80)	
No. of Students Referred		.02				.18					.08		.14
to Administration		(.001)				(.01)					(.003)		(.003)
In School Suspension2/		-.09											
		(-1.21)											

TABLE IV (Continued)

SUMMARY OF REGRESSIONS PREDICTING
SENIOR MATH TEST SCORES AND MATH COURSES TAKEN
USING SCHOOL CHARACTERISTICS 1/

ABILITY LEVEL OF SCHOOL OF STUDENTS	SENIOR MATH TEST SCORES						COURSES TAKEN						
	HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW	ALL ALL	HIGH ALL	HIGH HIGH	HIGH LOW	LOW ALL	LOW HIGH	LOW LOW
SCHOOL DISCIPLINARY PRACTICES (Cont.)													
Time Lag in Recognizing Students' Absences					.06 (.58)					-.09 (-.34)			
Time Lag in Recognizing AWOL Students					.12 (.90)	-.08 (-.38)					.07 (.21)		
% Teachers Strict		.07 (.008)							.12 (.006)	.13 (.01)		.11 (.008)	
Students Are Put on Probation2/										-.09 (-.53)			-.10 (-.41)
CLASSROOM TREATMENTS													
ASR - Teachers:													
Enjoy Work2/	.00 (.21)	-.02 (-.66)					-.03 (-.65)	-.07 (-1.45)	-.12 (-2.24)	-.07 (-.97)			-.14 (-1.26)
Clear in Presentations2/	-.03 (-1.63)	-.06 (-2.00)					-.02 (-.34)	-.07 (-1.60)	-.09 (-1.83)	-.05 (-.72)			-.15 (-1.34)
Work Hard to Learn2/	-.03 (-1.31)	-.02 (-.65)		-.05 (-1.94)			-.08 (-1.78)	-.12 (-2.34)	-.14 (-2.32)	-.11 (-1.55)			
Treat with Respect2/	-.01 (-.53)				-.09 (-1.98)		-.04 (-.78)	-.07 (-1.21)		-.17 (-2.10)			-.11 (-.80)
Witty and Humorous2/								-.03 (-.73)					-.09 (-.93)
Don't Talk Over Head2/							.01 (.13)	-.03 (-.67)		-.11 (-1.67)			
Patient & Understanding2/							-.02 (-.32)	-.03 (-.52)		-.15 (-1.91)			
Interested in Students2/	-.02 (-.49)						.07 (1.08)	.12 (1.73)	.13 (1.67)	.15 (1.45)			
Others See You as:													
Important	.04 (1.22)						.10 (1.51)	.14 (1.91)	.11 (1.30)	.16 (1.50)	.15 (1.98)		.15 (1.18)
Leading the World	.04 (1.27)							.06 (.96)	.05 (.65)				